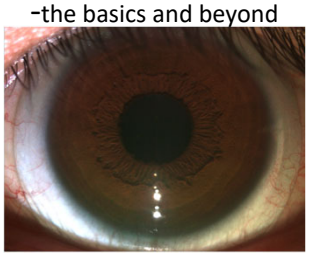
Scleral Lenses 101

-the basics and beyond



Julie DeKinder, O.D. FAAO, FSLS

Diplomate, Cornea, Contact Lenses and Refractive Technologies

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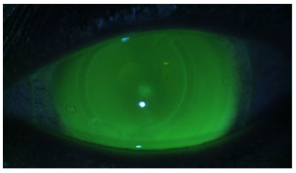
Overview



- Clinical Indications
- Advantages and Challenges
- Terminology
- Anterior eye anatomy
- Basic Design Features
- Instrumentation
- Fitting basics – lens selection, fitting, evaluation, follow-up
- Tips and Troubleshooting

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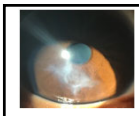
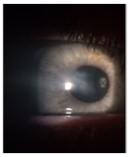
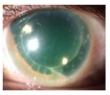


Clinical Indications



- Vision Improvement
  - *Correcting the irregular cornea*
    - *Corneal Ectasia*
      - *Primary – Keratoconus, Keratoglobus, Pellucid marginal degeneration (INTACS, CXL)*
      - *Secondary – post-refractive surgery, corneal trauma*
    - *Corneal Transplant*
    - *Corneal Degenerations*
  - *Normal Cornea*
    - *Presbyopia, moderate to high corneal astigmatism*



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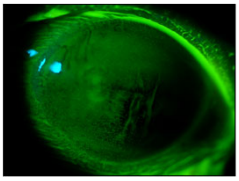
Clinical Indications

- Ocular Surface Protection
  - *Dry Eye*
  - *Incomplete lid closure*
  - *Sjorgen's Syndrome*
  - *Stevens-Johnson Syndrome*
  - *RCE / corneal abrasions*
  - *Graft host disease*
  - *Infiltrative keratitis*



Patient with Steven s-Johnson Syndrome; photo courtesy of Beth Kinoshita, O.D.

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Persistent corneal epithelial defects

- Epithelium-off CXL (16 year old male)
  - Constant epithelial defect for 2 months
    - Neomycin/dexamethasone, Zirgan, Oflaxacin, doxycycline, acyclovir, AT, BCL
  - Applied a scleral contact (15.6 diameter)
    - Wore extended wear for 6 days
    - Cont Maxitrol and oflaxacin drops
  - Lens removed after 6 days of wear
    - epithelial defect healed
    - overlying corneal haze

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Corneal Abrasion

- Healing response attributed:
  - Oxygenation
  - Moisture
    - Constant tear film
  - Protection of the corneal epithelium
    - Minimal abrasion
- *Allows epithelium to migrate, adhere, and proliferate over the persistent epithelial defect.*

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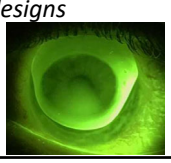
Clinical Indications

- *Cosmetic/Sports*
  - *Hand-painted scleral lenses*
  - *Ptosis*
  - *Water sports*
- *Lens failure in other designs*





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Advantages of Scleral GPs vs Corneal GP

- Centration
  - *Fitting a "regular" part of the eye*
- Lens Retention
  - *Minimal chance of inferior standoff*
- Comfort
  - *Reduced lid interaction; no corneal interaction*
- Vision
  - *Masking severe corneal irregularity*

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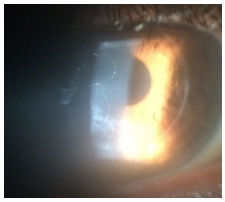
Challenges associated with scleral lenses

- Handling
  - *Difficult I and R (initially)*
  - *Apprehensive patients*
- Fitting
  - *Subtle fit indications*
  - *Increased chair time*
- Physiology
  - *Dk/L – Oxygen must diffuse over great distance*
  - *Long-term effects of scleral lens wear are unknown*



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Terminology

- Classification

– Corneo-scleral	12.9mm to 13.5mm
– Semi-Scleral	13.6 mm to 14.9mm
– Mini-Scleral	15.0mm to 18.00mm
– Full-Scleral	18.1mm to 24+

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Terminology

Lens Type	Description	Definition of Bearing Area
Corneal		Lens rests entirely on the cornea
Corneo-scleral		Lens rests partly on the cornea, partly on the sclera
Scleral	Mini-Scleral *Lens is up to 6mm larger than HVID*	Lens rests entirely on the sclera
	Large Scleral *Lens is more than 6mm larger than HVID*	

Scleral Lens Education Society
June 2013
www.sclerallens.org

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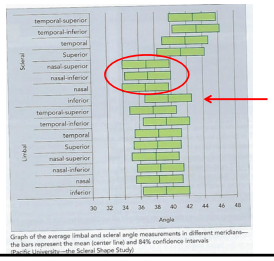
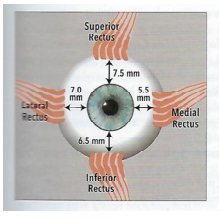
Anatomy and Shape of the Anterior Ocular Surface

- Maximum scleral lens size for normal eye: 24mm
- Scleral Shape Study



Graph of the average limbal and scleral angle measurements in different meridians—the bars represent the mean (center line) and 84% confidence intervals
Pacific University—the Scleral Shape Study



A guide to scleral lens fitting 2.0

Assuming 12mm cornea diameter – maximum physical diameter of a scleral lens ~24 mm

Anatomy and Shape of the Anterior Ocular Surface

- Corneal Toricity does not typically extend to sclera
- The ocular surface beyond the cornea is nonrotationally symmetrical
  - Asymmetrical
  - The entire nasal portion typically flatter compared to the rest

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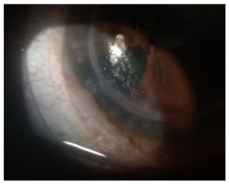
Anatomy and Shape of the Anterior Ocular Surface

- Clinical Consequences
  - Temporal-Inferior decentration of scleral lenses
    - Inferior decentration
      - Weight/gravity
      - Eyelid pressure
    - Temporal
      - Flatter nasal elevation
- Conjunctival Prolapse



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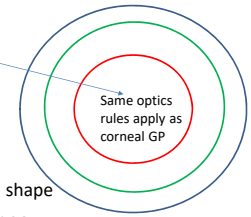
Basic Design Features

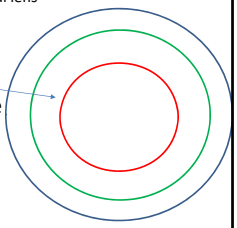
- Spherical Design
  - Concentric symmetrical (spherical) scleral lens
  - Non-toric back surface
  - Optic Zone
    - Centermost zone
    - Optics/Lens power
      - Anterior surface
    - Back surface
      - Ideally mimics corneal shape
    - Completely vaults cornea



UMSL Optometry

Basic Design Features

- Spherical Design
  - Concentric symmetrical (spherical) scleral lens
  - Non-toric back surface
  - Transition Zone
    - Mid-periphery or limbal zone
    - Creates the sagittal height
    - Can be reserve geometry
    - Completely vaults limbus



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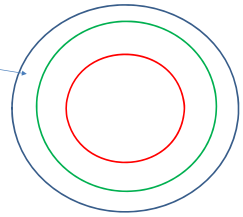
Basic Design Features

- Spherical Design
  - Concentric symmetrical (spherical) scleral lens
  - Non-toric back surface
  - Landing Zone
    - Area of the lens that rests on anterior ocular surface
    - Scleral zone or haptic
    - Alignment to provide even pressure distribution is key



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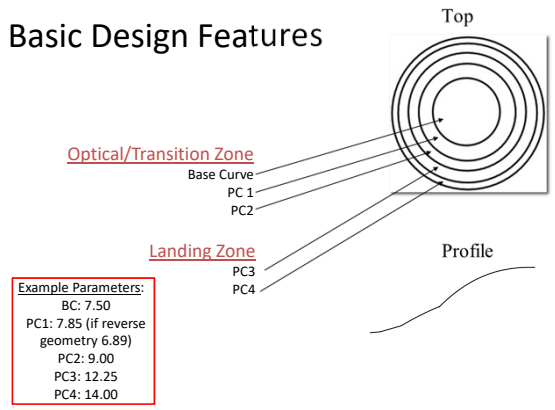
Basic Design Features



Basic Design Features

- Toric Lens Designs
  - Front Surface Toric -
    - Anterior surface front toric optics to improve vision
    - Located on the front surface of the central optical zone
    - Indicated when residual cylinder over-refraction is found
    - Needs stabilization
      - Dynamic stabilization zones or prism ballast
      - LARS

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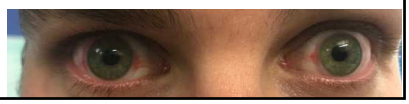
Basic Design Features

- Toric Lens Designs
  - Back Toric Haptics
    - Landing zone is made toric to improve lens fit
    - Does not interfere with central zone of scleral lens
    - Better ocular health
      - Fewer areas of localized pressure
      - Decreased bubble formation
      - Longer wearing time and better patient comfort
    - More frequently needed in larger diameter sclerals



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Basic Design Features

- Toric Lens Designs
  - Bitoric both anterior optics and back toric haptics
    - Front surface toric optical power
    - Back surface toric periphery
    - No need for lens stabilization

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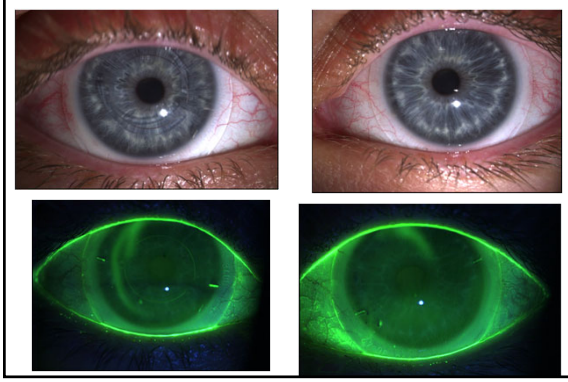

Basic Design Features

- Multifocal Scleral lens design
  - Simultaneous Multifocal Lens Design
    - Aspheric or concentric
    - Center Near and Center Distance Designs
      - Can adjust near powers
      - Can adjust zone size
    - Not all scleral lens designs have a MF option

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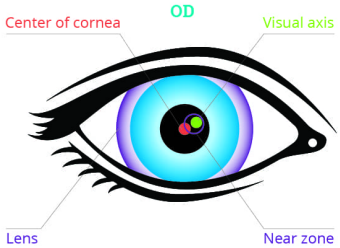
Basic Design Features

- Multifocal Scleral lens design



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http://www.aldenoptical.com/products/soft-specialty/zen-multifocal/zen-multifocal/

Basic Design Features

- Lens Material
  - High(est) Dk lens material; plasma or hydra-PEG
    - Considerably thicker when compared to corneal GP
      - 250 microns to 500 microns
    - Optimum Extreme, Menicon Z
- Increasing Oxygen transmissibility
  - 1. high Dk material (Dk > 125)
  - 2. minimal tear clearance behind the lens (<200)
  - 3. Reduced center thickness of the lens (<.250)

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Fitting Basics

- Hydra-PEG
  - *Polyethylene glycol (PEG) – base polymer*
    - *Covalently bonded to the lens surface*
    - *Creates a wetting ocular surface, increases surface wettability, increases lubricity, decreases protein and lipid deposits, improves TBUT.*

Cleaning and disinfecting

Monthly conditioning solution to restore the coating

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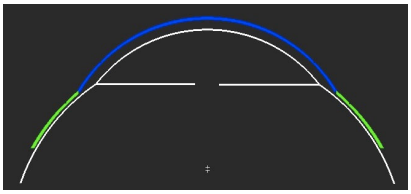
Fitting Basics

- Completely vault the *cornea* and *limbus* while aligning to the *bulbar conjunctiva*



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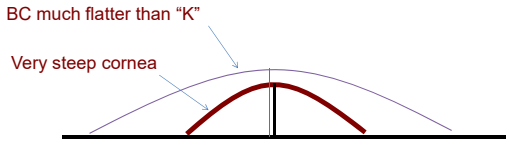
Fitting Basics

How can I vault a steep cornea with a flat lens?



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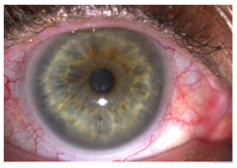
Fitting Basics

- 1. Diameter
- 2. Clearance
- 3. Landing Zone Fit
- 4. Lens Edge
- 5. Asymmetrical Back Surface Design
  - Some trial sets are toric back surface
- 6. Lens Power



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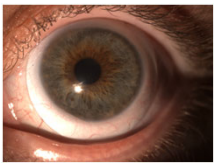
Fitting Basics

- 1. Diameter
  - Choose a Fitting Set
    - Direct vs Indirect control
  - Laboratory warranty/exchange policy
  - Overall Diameter
    - Larger – more clearance needed, ectasias
    - Smaller – easier to handle, less clearance



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Fitting Basics

- 1. Diameter
  - HVID
    - <12mm
      - Start with a 16.0 mm or smaller lens
    - >12mm
      - Start with a 16.0 mm or larger lens
  - Diameter of the optical zone and the transition zone chosen roughly 0.2mm larger than the corneal diameter

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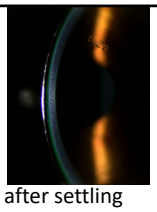
Fitting Basics



- 2. Clearance
  - Minimum of ~100 microns
  - Typically aim for 200-300 microns after settling
  - Maximum of 600 (if desired)
  - Base Curve Determination
    - Select an initial base curve that is flatter than the flat k value
    - Use 14 mm chord OCT, measure sagittal depth

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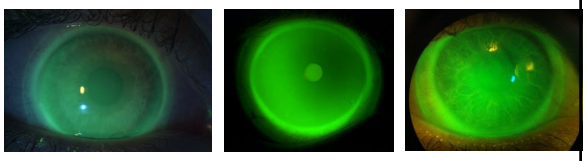
Fitting Basics

- Evaluate overall corneal chamber appearance
  - Diffuse beam, low mag, medium illumination
  - Observe centration, areas of bearing, tear lens appearance, look for bubbles



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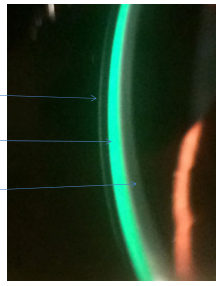
Fitting Basics

Estimate Corneal Clearance



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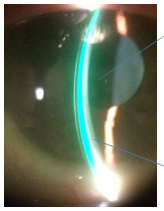
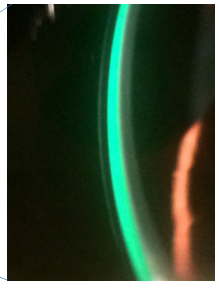
Fitting Basics

- Evaluate central clearance



**Compare lens thickness to tear lens thickness and estimate central clearance in microns*



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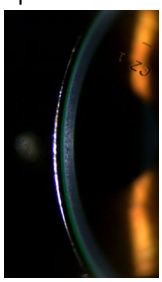
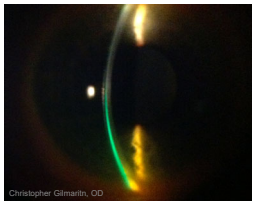
Fitting Basics

Look for continuity of the tear lens…

Acceptable clearance:

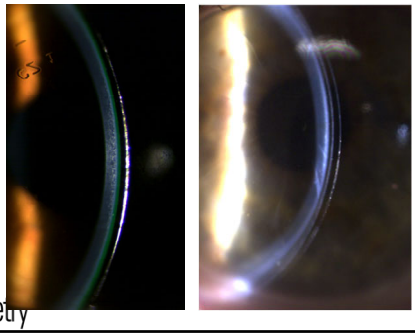


Too little clearance:



Fitting Basics

Look for continuity of the tear lens…



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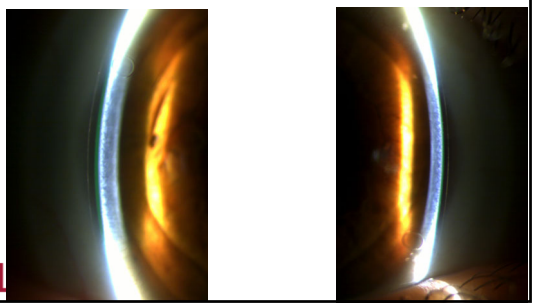
Fitting Basics

Evaluate the Limbal Clearance…



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Fitting Basics

- Change lens base curve/sagittal depth until desired central clearance is reached
  - Considerations:
    - All scleral lenses will settle over a period of hours
    - Expect ~ 90 to 150 microns settling
    - Aim for 150 to 300 microns *after* settling
    - Build-in settling time into fitting session ~30 min

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Fitting Basics

- UMSL Study:
  - No significant settling after 4 hours of wear
  - Most settling within the 1st hour
  - Large Diameter Scleral settle ~90 microns, slower
  - Mini Scleral ~130 microns, faster

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Fitting Basics

- Evaluate remaining corneal chamber
  - Optic Section
  - Sweep limbus to limbus noting tear lens thickness
  - Looking for tears in optic section beyond the limbus and should increase in thickness toward the central cornea

*** Adequate limbal clearance is critical for an acceptable fit and good tear exchange****

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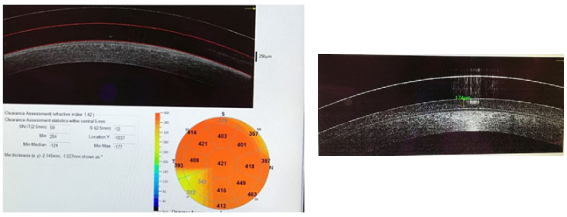
Fitting Basics

- Anterior Segment OCT



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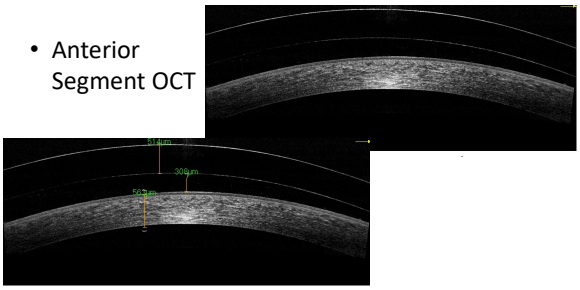
Fitting Basics

- Anterior Segment OCT



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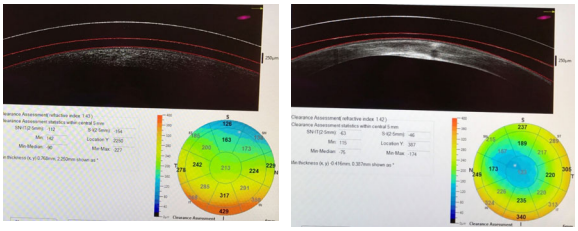
Anterior Seg OCT



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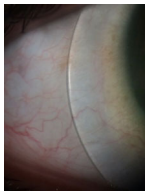
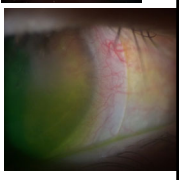
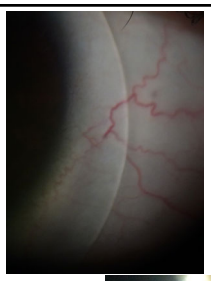
Fitting Basics

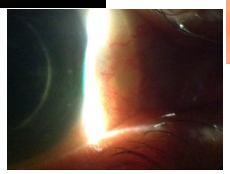


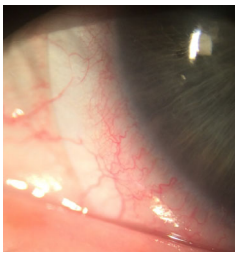


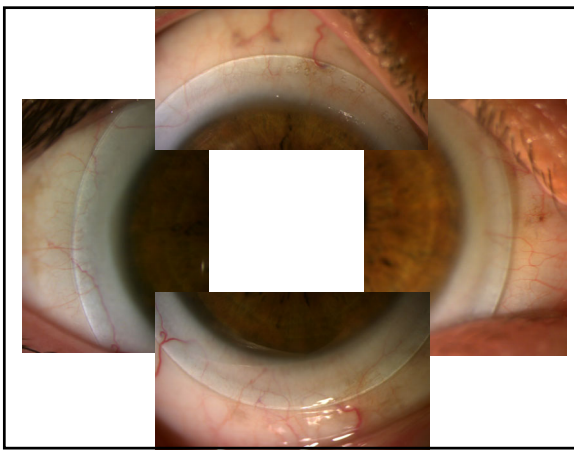
- 3/4. Landing Zone Fit/Edge
  - Bulbar conjunctival vessels
  - Look for blanching
    - *Inappropriate scleral curve alignment*
    - *Typically indicates PC is too tight*
    - *Or new toric back surface haptics*
  - Confirm no lens movement
  - Perform all peripheral lens evaluations in Primary Gaze.
- Ideal alignment when vessels course unobstructed under the scleral curves

Fitting Basics



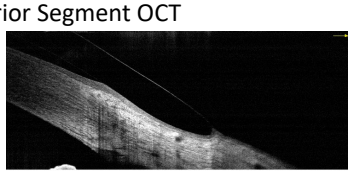


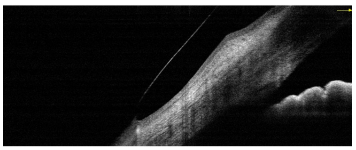




Fitting Basics

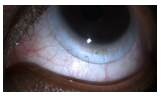
- Anterior Segment OCT

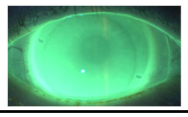


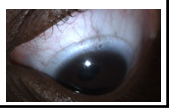


Fitting Basics

- 5. Asymmetrical Back Surface Design
  - Allows for more equal pressure distribution
  - Can help center a inferiorly decentered lens
  - Flat and steep meridian
    - Can adjust either independently
    - Flat meridian is typically marked
    - Will lock into place







Fitting Basics

- 6. Lens Power/Over-Refraction
  - Expect close to spherical OR
  - If OR yields significant cylinder check - flexure
    - Do over-keratometry or over-topography
  - Residual Cylinder
    - Front surface toric
    - Usually has a great visual outcome

UMSL Optometry

Fitting Basics

- Design and Order
  - Often lens modifications will need to be made from the best trial lens fit
  - Lab Consultants are helpful
    - Some warranties require consultation when re-ordering

UMSL Optometry

Fitting Basics
Scleral Lens Handling

- Insertion
  - Prepare Lens
    - Large DMV
    - Clean lens, rinse
  - Fill with non-preserved sol
    - 0.9% NaCl inhalation sol
    - Off label: Addipak, Modudose
    - Lacripure, ScleralFil (buffered)
    - Refresh Optive single vials
    - Celluvisc

UMSL Optometry

Is buffered better??

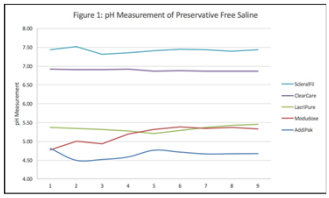


Table 1	Average	Range	Difference	Std. Deviation
ScleralFil	7.43	7.32-7.52	0.20	0.053
ClearCare	6.89	6.87-6.92	0.05	0.021
LacriPure	5.33	5.21-5.45	0.24	0.075
Modudose	5.17	4.78-5.38	0.60	0.216
AddiPak	4.67	4.50-4.82	0.32	0.107

Current accepted pH range of 6.60 to 7.80 for ocular comfort

Fitting Basics
Scleral Lens Handling

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Fitting Basics
Lens Insertion

- Place paper towels on patient's lap
- Have patient tuck chin to chest and look straight down
- Have patient hold lower lid
- Clinician hold upper lid
- Insert lens straight onto cornea

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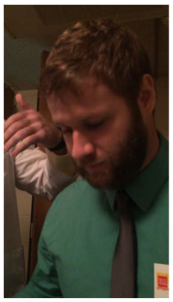
Fitting Basics
Scleral Lens Handling

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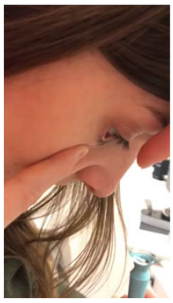
Fitting Basics
Lens Application




Fitting Basics
Scleral Lens Handling

- Removal
  - Loosen Lens – gently nudge lens
  - Medium DMV
    - placed on inferior portion of lens
  - Hold both lids

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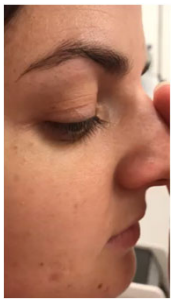
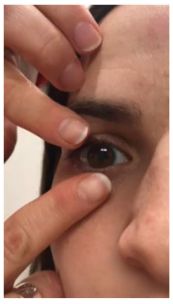
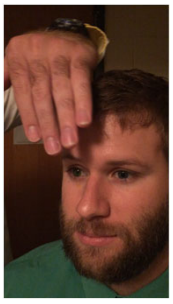
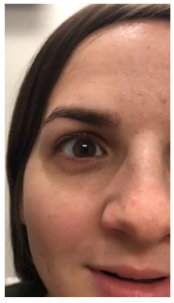
Fitting Basics
Lens Removal

Fitting Basics
Scleral Lens Handling

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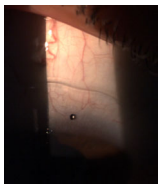
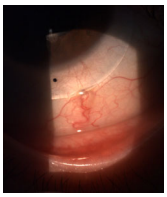
Fitting Basics
Scleral Lens Handling

- Educate patient about proper lens orientation upon insertion
  - Dots at 6 o'clock

UMSL Optometry

Parameter Considerations

- Common Parameter Changes:
  - Sagittal Height
  - Overall diameter (OAD)
  - Optic Zone Diameter (OZD)
  - Base Curve (BC)
  - PC width
  - PC radius of curvature
  - Center Thickness

UMSL Optometry

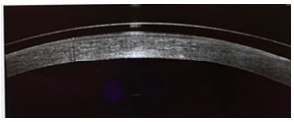
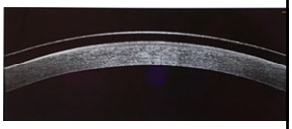
Parameter Considerations

- Common Parameter Changes:
  - Sagittal Height
    - Adjustment to the transition zone
    - Allows clinician to increase or decrease central lens clearance without adjusting base curve or peripheral lens curves
    - Indicate to lab the amount of clearance you want to gain or lose

UMSL Optometry

Patient GH

- Fit in 2013
- OD: 7.50 / -7.00 / 14.5 20/50
- OS: 7.5 / -7.50 / 14.5 20/40
- SLE: central touch in both eyes
  - Increase diameter; increase sagittal height; steepen lens

UMSL Optometry

Patient GH

- New Scleral Lens
  - OD: 7.5 / 14.8 / -7.50 -1.25 x 013 20/30
    - 1.5 steep limbal zone
  - OS: 7.18 / 14.8 / -8.25 -0.75 x 162 20/40+
    - 1 step flat limbal zone; 1 step flat scleral zone



UMSL Optometry

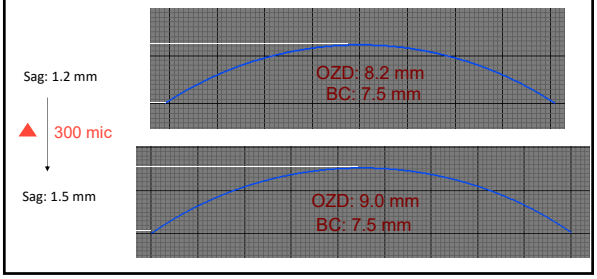
Parameter Considerations

- Common Parameter Changes:
  - Overall diameter (OAD) / Optic Zone Diameter (OZD)
    - Can increase or decrease
      - More likely to increase
    - If you need additional central clearance
      - Can increase OZD which will increase OAD
    - If you need more clearance at limbus
      - Can increase OZD which will increase OAD

UMSL Optometry

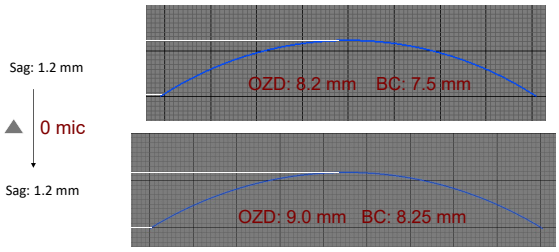
Parameter Considerations

- OZD changes: often done to improve fit
  - OZD increase *without* BC compensation



Parameter Considerations

- Increase OZD *with* BC compensation



* Increased OZD *without* increasing sagittal height of lens

Parameter Considerations

- Common Parameter Changes:
  - Base Curve (BC)
    - Typically adjusted during initial fit
    - Flatter base curve to address peripheral lens tightness or excessive central clearance
    - Steeper base curve to increase central clearance or loose periphery
  - If you need to adjust the central clearance, but you are happy with peripheral alignment
    - Adjust sagittal height NOT base curve

UMSL Optometry

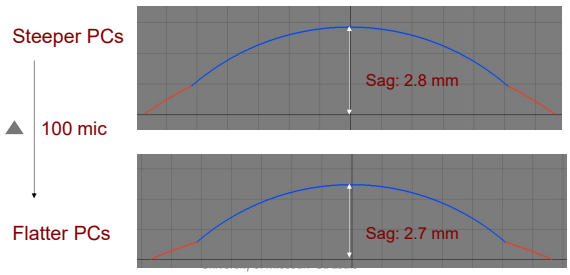
Parameter Considerations

- Common Parameter Changes:
  - PC width / PC radius of curvature
    - Make wider or smaller
    - Steeper or flatter
    - Toric Haptics
  - Center Thickness
    - Can increase or decrease
      - Considerations: flexure and edema

UMSL Optometry

Parameter Considerations

- Scleral Curve Changes



Tips for Fitting

- 1. Go flatter than flat K value for initial lens selection
- 2. Use Fluorescein for initial lens selection
  - Use BLUE Light – GET THE BIG PICTURE
  - Use WHITE Light – to evaluate everything else
- 3. Analyze Superior and Inferior lens edges in Primary Gaze
- 4. Try not to make parameter changes at dispensing
- 5. Toric Haptics – spin lens and watch for quick return

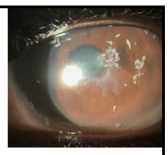
UMSL Optometry

Tips for Follow-up

- 1. Ask patient: "How do you take care of your lenses"
- 2. Follow-up should be at least 2 hours after lens insertion
- 3. Paint the front of the lens to look for fluid exchange
- 4. Remove lens and evaluate cornea

UMSL Optometry

Troubleshooting

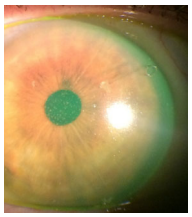


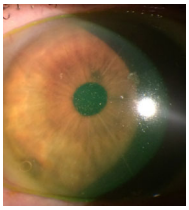
- Problem: <u>Decreased vision after insertion</u>
  - Often caused by mucin build-up in tear lens
  - Begins ~30min to 4 hrs after insertion
- Possible Solutions
  - Reinsert lens with fresh solution/ use solution mixture
  - Rx lid hygiene
  - Rinse eye prior to insertion
  - Refit with decreased central clearance/better peripheral alignment
  - Change lens material or Lens coating – Hydra-PEG

UMSL Optometry

Troubleshooting

- Decreased Vision after Insertion





Patient states vision gets foggy after 2 hours of wear and gradual decreases in clarity over time

~200 microns clearance OD/OS

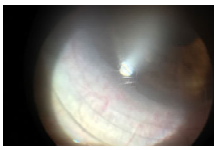
NaFL seeps under lens superiorly OD and 360 OS

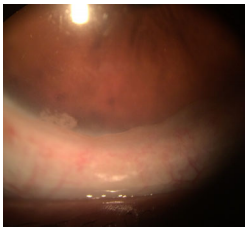
Re-order: steeper PC OU

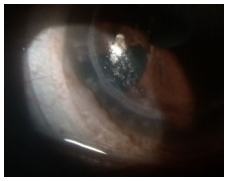
UMSL Optometry

Troubleshooting

- Conjunctival Prolapse







UMSL Optometry

Troubleshooting

<u>Conjunctival Prolapse</u>

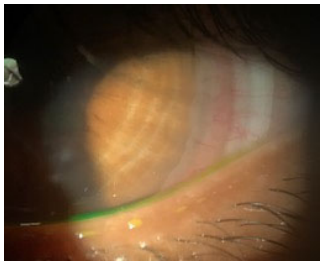
- Caused by negative pressure under the lens
- More prominent in patients with loose conjunctival tissue or elderly patients
- Check for neovascularization
- Solution
  - 1. Fit a asymmetrical back surface scleral lens to help alleviate the problem
  - 2. Decrease limbal clearance

UMSL Optometry

Troubleshooting

<u>Conjunctival Prolapse</u>

- Prolapse with tight PC
  - Flatten the PC

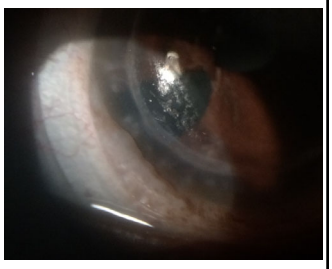


UMSL Optometry

Troubleshooting

Conjunctival Prolapse

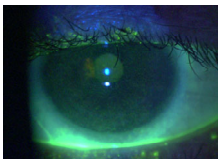
- Prolapse with peripheral alignment
  - Decrease the limbal clearance
  - 2 ways:
    - Flatten the BC
    - Decrease the reverse curve



UMSL Optometry

Troubleshooting

- Problem: Diffuse Corneal Staining on follow-up
  - Due to fill media, care systems, AT's or meds
  - Can be difficult to isolate cause
  - Can be more significant if tear exchange is low
- Possible solutions:
  - Switch Care systems
  - Rx 0.9%NaCl inhalation solution
  - Completely rinse MPS off lens
  - Confirm compliance with prescribed care



UMSL Optometry

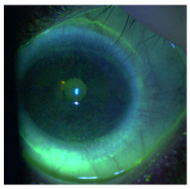
A severe case of stain

- 27 yo patient with Keratoconus OU
  - Wearing scleral lens OU – 2014
  - Hx of Corneal Crosslinking OU ('09)
- Presents 7/2017
  - Cc: blurred vision OS> OD
  - using clear care to clean lenses
  - sometimes sleeps in lenses
  - uses Boston Advance to fill lenses prior to insertion

UMSL Optometry

A severe case of stain

- 27 yo patient with Keratoconus OU
  - VA 20/30– OD 20/125 OS
  - SLE: Punctate staining OU, mild corneal edema OS
  - 150 microns clearance OU
  - Adequate limbal clearance
  - No peripheral blanching or impingement
- Plan: educated patient about proper lens care; RTC 1 week fitting



UMSL Optometry

Troubleshooting

- Problem: Poor surface wetting
  - MGD can contribute / cause problem
  - Multipurpose Solution (MPS) may cause problems
  - Lens Material
- Possible Solutions:
  - Evaluate lid margins/ tear film
  - Prescribe lid hygiene if necessary
  - Change MPS / Lens material
  - Lens Coating – hydra-PEG

39 yo female
PKP OD / KCN OS
Jupitor scleral OU – Tyro 97
Issues with surface wettability

Re-order OU with hydra-PEG
Patient LOVES hydra-PEG – has significantly decreased surface deposits and she does not have to remove to clean during the day.

UMSL Optometry

Troubleshooting

- Problem: Poor surface wetting (old lens)
  - Lens Coating break-down
  - Lens Material break-down
- Possible Solutions:
  - Order new lenses (with HydraPEG)
  - Clean with laboratory cleaner
  - Prescribe Progent

UMSL Optometry

Troubleshooting

- Problem: Corneal edema at follow-up
  - Can arise after weeks / months => f/u is important!
  - More common in post PK corneas
  - Higher risk in corneas with low endothelial cell count
  - Consider Dk/L as Dk is likely not the issue
- Possible Solutions:
  - Prevention: do endothelial cell count before fitting (1000 +?)
  - Scrutinize grafts at *every* visit!
  - Educate graft patients on symptoms of rejection: pain, light sensitivity, redness, blurred vision

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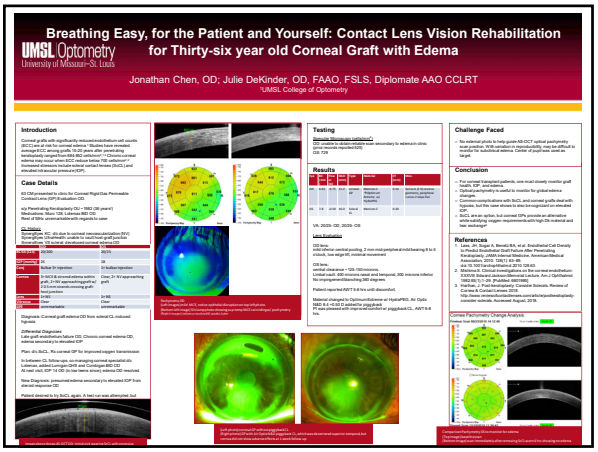


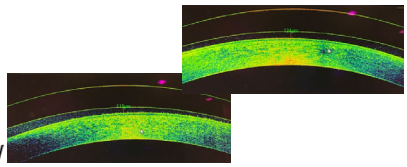
Troubleshooting

- Keratoconus and Fuchs! Oh My!
- 64 you Female with Keratoconus
  - Presents with blurry vision in scleral lenses and irritation OU
    - Lenses are uncomfortable and dry
    - Redness OU
  - Interested in Eyeprint PRO
  - 20/40- OD 20/30- OS HVID 12mm
  - OD: +0.75 -4.00 x 175 20/40- OS: +1.50 -3.50 x 180 20/30-
  - Pingecula Temporal and Nasal OU

UMSL Optometry

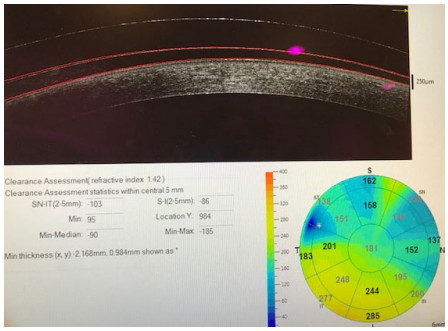
Case TS: KCN and Fuchs

- Initial FITTING
- *HVID 12mm; Pingecula T/N OU*
  - 8.4 base curve 4.6 sagittal height 17.0 diameter
  - OR: +3.75 -0.75 x 180 20/25-- +4.00 -0.75 x 180 20/30
- Options to Troubleshoot Pingecula:
  - Microvault
  - Toric PC



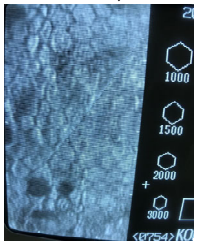
UMSL Optometry

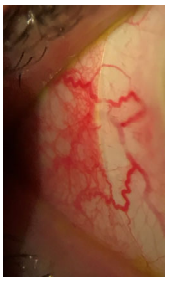
Case TS: KCN and Fuchs



Case TS: KCN and Fuchs

- Keratoconus and Fuchs! Oh My!
  - At one year follow-up





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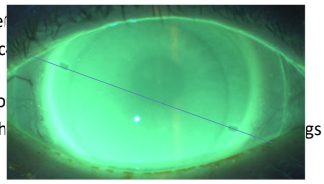
Case TS: KCN and Fuchs

- Toric Haptics/Periphe
  - Steepen the Vertic horizontal
  - Flatten the hortizo
  - Always evaluate th gs



- MicroVault
  - Confirm lens design can incorporate microvaults
  - Measure location and size

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Troubleshooting

- Problem: <u>Discomfort immediately after insertion</u>
  - *Ask patient where discomfort is located*
  - Poor peripheral fit – too flat
  - Base curve too flat- central bearing or touch
  - Mucus adhered to back surface of lens
- Possible solutions:
  - Adjust peripheral systems for proper alignment
  - Select steeper base curve
  - Clean inside of bowl daily; prescribe Progent (Menicon) to remove mucus

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Troubleshooting

- Problem: <u>Discomfort after several hours of wear</u>
  - Follow-up patient questions
  - Does your eye become red while wearing the lens?
  - Does your eye become red after lens removal?
  - Where is the irritation located?
  - Do you notice any changes in your vision?
  - What solution(s) are you using for lens application?

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Troubleshooting

- Problem: <u>Discomfort after several hours of wear</u>
  - Poor peripheral fit (too steep)
  - Lens is too small to support its weight
  - Corneal chamber too small
- Possible solutions:
  - Adjust peripheral systems for proper alignment
  - Increase surface area of scleral curves
  - Increase OAD or corneal chamber size if appropriate

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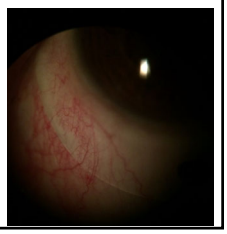
Troubleshooting

- Problem: <u>Lens hurts upon removal with subsequent difficulty wearing it the next day</u>
  - Poor peripheral fit – scleral compression
    - Causing rebound hyperemia and inflammation
- Possible solutions:
  - Changing Diameter
  - Changing peripheral curves



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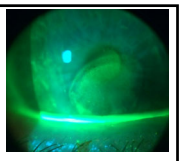
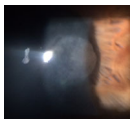
Troubleshooting





- Problem: Bubbles under the lens
- Too much sagittal height/Too flat peripheral curves
  - Improper insertion
  - Fenestration hole
- Possible Solutions:
  - Fill bowl completely with solution prior to insertion
  - Remove fenestration hole
  - Central bubble: Adjust lens parameters to decrease sagittal height
  - Peripheral bubbles: steepen peripheral curves or increase lens diameter

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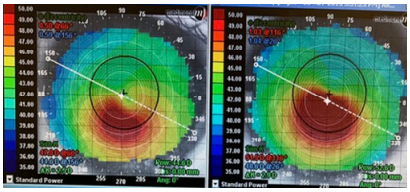
Patient AB

- History: KCN OU; crosslinking OU
- Lens history: soft toric lenses



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Patient AB

- Examination findings
  - MR:
    - OD +0.75 -3.50 x 060 20/70+
    - OS -0.25 -0.75 x 142 20/100+
  - Lens options
    - Specialty Corneal lens
      - Patient attempted to wear and could not adapt
    - Intralimbal design
      - Patient attempted to wear and could not adapt
    - Scleral Lens

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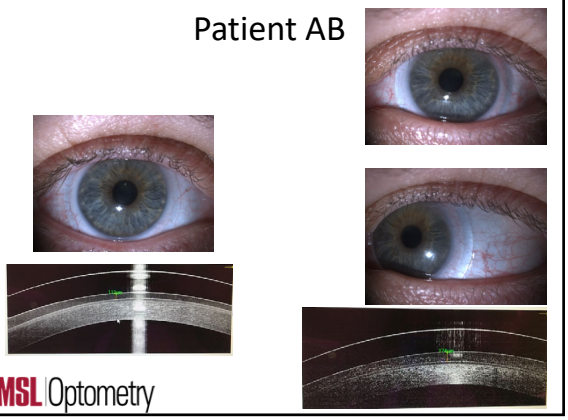
Patient AB



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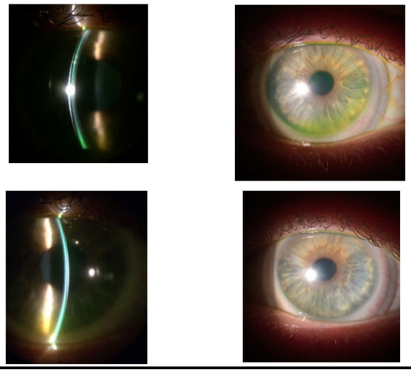
Patient AB



Final Thoughts

- Consider mini-scleral / scleral for appropriate patients
  - Select one lab, one design
- First couple fits are the most challenging
- Scleral lenses are not going away
- Consultants are a great resource
- Huge practice building opportunity

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